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DATA

ON

"BESSEMER PAINT"

(REGISTERED TRADEMARK)

Mr. _____

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Compliments of

RINALD BROTHERS

PHILADELPHIA

SPECIFICATION

FOR

"BESSEMER PAINT"

(AS WE SHOULD ADVISE TO WRITE IT)

All metal to be painted must be thoroughly clean, free from rust and dry. Apply one shop coat of Bessemer Paint, made by Rinald Bros., Philadelphia, using the paint strictly in accordance with manufacturer's instructions. Before erecting touch up all bare or scratched surfaces, and give an extra coat to all parts not accessible after erection. Apply second or field coat as soon after erection as possible, brushing the paint out thoroughly. Avoid heavy coats, and do not thin the paint which is furnished ready for use.

DATA

ON

"Bessemer Paint"

(Registered Trademark)

RINALD BROTHERS

PHILADELPHIA

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In the course of time our publications referring to BESSEMER PAINT have become rather numerous. It was, therefore, deemed advisable to collect and condense them into one treatise, giving only their essential points. To anybody wishing to investigate our claims at greater length, or wanting a detailed explanation regarding any of the statements on the following pages, we shall cheerfully furnish all information in our possession. It is always more of a pleasure than a task for us to discuss the different phases of a question of such importance, and at the same time of such interest, as that of rusting and of the means to prevent corrosion.

We have carefully investigated and tested every one of the numerous new paints brought out from time to time, for each of which it is claimed that it will protect metal against rusting. We shall continue these investigations and practical tests, and we can assure our friends that if ever we should come across a paint better adapted for the protection of iron than our BESSEMER PAINT, we shall certainly not hesitate to adopt it, if it is to be had. Up to this writing, however, there has been nothing in the market which will resist the peculiar atmospheric conditions in large cities and in the vicinity of railroads as thoroughly as BESSEMER PAINT. In our "Review of Pigments and Vehicles Used in Paints for Iron" the reasons for this will be found. In our pamphlet, "Iron vs. Rust," of which a reprint is given herewith, BESSEMER PAINT in particular was dwelt upon. In our treatise "About Rust" we went into details regarding the danger of using inadequate paints, such as Red Lead or Iron Oxide, for the protection of skeleton structures, where the iron certainly ought to be protected against rust as thoroughly as possible. In the same pamphlet we spoke of the electrical influences which attack iron and steel, and which are encouraged by metallic paints, while BESSEMER PAINT will protect iron and steel against them to a very large degree, and in most cases will prevent

galvanic action. The greater part of that publication has been embodied in this one.

We are glad to note that the practice of giving one paint the preference over another simply because it costs a few cents less is on the wane, no doubt, because it has become too apparent that it is really not a saving, but the grossest kind of extravagance to save a few hundred dollars on paint with the result of having the iron rust more quickly than it would if it had never been painted at all.

BESSEMER PAINT is by no means a new material, but one that has been thoroughly tried in every respect. It is also by no means expensive, notwithstanding its rather high price per gallon, which is an eye-sore to the purchasing agents of many of our customers, who do not realize that where they buy one barrel of BESSEMER PAINT from us at $1.50 per gallon, they would have to buy about three barrels of almost any other paint. BESSEMER PAINT actually *costs two-thirds less than Red Lead* where both paints are applied side by side in two-coat work. This is *not our claim, but a fact established by official testing stations* of the German government, and *verified daily* by consumers. (For details see pages 28 and 31). We mention this chiefly for the benefit of contractors and purchasing agents. We are quite convinced that the owner or the engineer of any large structure will scarcely need to reflect in order to understand that if he can obtain a material which prevents rusting, the price thereof is really of no consequence.

We cannot lay too much stress on the necessity of correct specification and its enforcement. **In writing specifications for BESSEMER PAINT we would advise to be guided by the suggestions given on pages** 23, 24, and third page of cover.

Iron vs. Rust.

From the earliest times the notion has prevailed that to protect iron a heavy layer of paint should be applied. Oxide of lead used to be the pigment employed for that purpose; but so many well-founded objections to it have arisen within the last twenty years, that it will scarcely be necessary to enumerate them. Other metallic oxides or metallic paints have also, in a number of cases, proved to affect the iron through their electrical influence. Besides, it is well-known that most mineral paints are either not very durable on account of their chemical composition, or contain adulteration of a basic or acid nature. Their chemical tendencies are often apt to make them enter new combinations after they have become dry, and thus the coating itself may di-

rectly induce corrosion of the iron or self-destruction.

It is therefore essential that a pigment should be used which is chemically indifferent, and protects the iron from electrical as well as chemical influences. This is well-known to every chemist or engineer and a great many paint manufacturers also acknowledge it, and, as a consequence, numerous paints are now in the market whose pigments are non-metallic. The great disadvantage we have found in all those which have come under our observation was, that they will dry out perfectly hard, and in consequence become brittle in time. Once brittle, they no longer follow the expansion of the iron, and cracks or fissures will be the result. In these fissures the rust finds a starting place wherefrom it undermines the paint and causes it to peel off. A further disadvantage becomes apparent as the paint continues drying. Then the layer of paint loses its hold on the metal, the particles forming the pigment are only loosely held together and a severe rainstorm is liable to wash the paint off. On Railroad Bridges

this is especially apt to happen, because there the constant vibration joins forces with the atmospheric influences in their work of destruction.

The binding material which is used in most paints is linseed oil. Now, linseed oil will dry out, and as soon as it becomes dry, the paint will lose its elasticity and not be able to follow the expansion or contraction of the iron, no matter how good the pigment may be.

Well aware of all these circumstances we have tried to find a paint without any of the shortcomings just mentioned and have found it in BESSEMER PAINT, *which we make in accordance with the following principles:*

FIRST—*The pigment to be free from oxide, electrical qualities, or the least adulteration of an acid or basic nature; the greatest chemical indifference to be a desideratum.*

SECOND—*The pigment to be of first-class covering capacity, so that only a thin coating would be required, and thus make it possible for the paint to adhere so closely to the iron, that under no circumstances it might be shaken off or split off.*

THIRD—*The binding material to be of such a nature that it would not dry as hard as lacquer, because that would injure its adhesive qualities, and at the same time not remain so soft that it might be affected by a rainstorm or rubbed off mechanically.*

FOURTH—*The binding material to be just as little affected by electricity, chemical fumes or solutions and atmospherical influences as the pigment itself.*

FIFTH—*The binding material to amalgamate thoroughly with the pigment, so that the flexibility of the compound might be affected by heat or cold in exactly the same manner as iron.*

Bessemer Paint has been in the market for many years and notwithstanding the fact that it is incorrectly classified among "Patent Paints" (we prefer a secret process to a patented one) it stands now foremost *amongst paints for structural iron work. Those who have used it to any extent all admit that while a gallon of it costs more than a gallon of most other paints, a square foot of surface painted with Bessemer*

Paint, two coat work, is not beyond the cost price of a square foot covered with two coats of good Metallic Paint and, of course, way below the cost of a square foot painted with Red Lead. They also admit that it is more easily applied than other paints as soon as the foreman has convinced his men that a brush half full of Bessemer Paint covers more surface and requires less strength *for spreading than a large brush soaking full with heavy Metallic Paint. So soon as the men have learned to put Bessemer Paint on correctly so soon it will be found that* BESSEMER PAINT is not only the most durable, but also the quickest drying, the easiest applied, and the least expensive paint for Iron and Steel.

REVIEW OF PIGMENTS AND VEHICLES USED IN PAINTS FOR IRON.

The paints most largely used for painting structural iron are composed of the following ingredients:—

1st —**Red Lead** mixed with pure Linseed Oil.

2d.—**Iron Oxide** (*Metallic Brown*) and other pigments containing Iron Oxide in combination with Sulphate of Lime (*Venetian Red, etc.*), mixed with pure Linseed Oil.

3d.—**Graphite or Carbon** (*Plumbago, Black Lead*) mixed with pure Linseed Oil.

4th.—The above pigments mixed with so-called "**Paint Oil.**"

5th.—**Asphaltum, Coal Tar** and other bituminous products dissolved in Turpentine, Benzine, Benzol and Linseed Oil.

6th.—**Petroleum Refuse,** *i. e.*, solid matter obtained in the refining of Petroleum dissolved in *Bisulphide of Carbon.*

Before we discuss the ways in which these paints behave when exposed to atmospherical conditions prevalent in cities or near manufacturing establishments, we desire to make the following statements regarding the vehicles:

A.—**Linseed Oil,** which is generally regarded as the best vehicle for binding a pigment to the iron, is not impermeable to gases When spread upon a surface, it forms a tough skin after drying, but this skin is porous. On account of this very reason, Linseed Oil forms an admirable vehicle for all paints to be used on woodwork, which have to be porous to some extent in order to allow moisture in the wood to escape, whereby the danger of dry rot is avoided. For paint on iron it is essential to have a vehicle which is non-porous, so as to prevent the air from reaching the iron. Linseed Oil by itself "superoxidizes" within a few years when exposed to the air on metal. In this condition it will become sticky, and finally, in about three years, will run down as a semi-fluid mass where applied by itself to a vertical surface. (*Vide* London (Eng.) "Journal Society Chemical Industry," November 30, 1894; article, "Note on Oxidized Linseed Oil.")

B.—**Paint Oils.**—There is little use speaking about these. We have carefully looked into all that have come to our notice, and find they invariably contain petroleum in one form or another, and that the gum is chiefly supplied by turpentine remnants or some other gummy substance, which, however, is soon rendered inactive by the petroleum. These paint oils, as a rule, also contain a considerable amount of water, and are detrimental in every respect. To the painter they are attractive, in so far as they permit of spreading the paint in the same manner as whitewash. They act as rust producers in the highest degree, because in themselves they contain the ingredients necessary to retain gases by transforming them into acids.

C.—**Bisulphide of Carbon** is a good vehicle for a perfect pigment, provided the latter covers thoroughly after the Bisulphide has evaporated. In our opinion it exerts neither a detrimental nor a beneficial influence over the pigment dissolved in it. Its mission is simply to deposit it. It is, however, an exceedingly dangerous material to use in any place, as it is very inflammable and explosive. The men applying it should also be extremely careful not to inhale its gases, which are dangerous to health, and are said to have produced dementia in a number of cases. We have not been able to verify an assertion made by some parties that Bisulphide of Carbon would give up some of its sulphur to the iron, and do not consider this as probable.

We now come to the pigments, and to the way in which they are affected by combustion gases permeating the air near railroads and industrial establishments:

1st.—**Red Lead,** when applied in the shape of paint, forms a kind of cement with the Linseed Oil, which it saponifies. Thus considerable hardness is produced, but at the same time the gummy, elastic nature of the oil is destroyed. Where iron is subject to a good deal of expansion as a result of the hot rays of a summer sun beating down upon it for hours at a time, numberless fine cracks will result, which are scarcely noticeable, as soon as contraction has again taken place. In every one of these cracks, however, the iron is exposed to oxidation, having

nothing to protect it against the air. A still greater danger lies in the presence of sulphurous acid gas and carbonic acid gas, both of which are contained in combustion fumes, and for *both of which red lead has a very great affinity.*

On cool days, steam saturated with these gases is apt to condense on the metal, and sulphuretted hydrogen and sulphuric acid result therefrom. Both these agencies quickly destroy Red Lead, which, therefore, is about the worst material that can be used on a bridge or in a train shed exposed to combustion gases. The rusting of such surfaces is also accelerated by galvanic action, which causes the pitting so often observed on such surfaces. (*Vide* "About Rust," p. 22, f. f.).

2d.—**Iron Oxide**, *i. e.*, **Rust**, when used as a pigment, exerts a drying influence on the oil, which is claimed as an advantage by the makers. It is, on the contrary, a disadvantage, in so far as it superoxidizes ("burns") the oil so that the oxide has nothing to hold it to the iron, and therefore drops off, unless, indeed, the permeability of the oil has previously allowed the gases to attack the iron before the binding qualities of the oil have been altogether destroyed. In that case the rust applied as a pigment combines with the rust produced by oxidation, and the whole surface is soon covered with a uniform coating of active rust. If the pigment contained sulphur, which it nearly always does, the rusting is naturally accelerated, and the name of "rust producers, rather than rust preventers," which we have heard used so frequently in regard to Iron Oxides, would not seem a misnomer for these pigments.

3d.—**Graphite**, also called Plumbago, or Black Lead, is a very good pigment in itself, as it is not affected by chemical or electrical agents of the kind which affect a bridge paint. It refuses however, to combine in any way with Linseed Oil, but is simply glued on by the oil, and when the latter begins to lose its gummy nature, the Graphite begins to flake off, and to be washed off by rainstorms. Another disadvantage, especially on train sheds, roofs, etc., is its quality as a lubricator. Carbon (Lampblack, Gas Black, etc.), acts just like Graphite, which latter is nothing but Carbon in its purest form.

4th.—**Asphaltum, Coal Tar,** and other bituminous products, as also **Petroleum Refuse,** can scarcely be classified as pigments. Asphaltum is softened by a comparatively low degree of heat, and under a hot summer sun the Asphaltum on a vertical surface can always be observed to "run" or "crawl." There are some high grades which will soften, and then when the metal begins to cool off, will resume their former handsome appearance. During their softening, however, they have permitted the gases to pass through them and to act upon the iron. A thin layer of active rust will be found under all kinds of Asphaltum paint exposed to a gaseous atmosphere, even when the paint is apparently in perfect condition. This rust continues to work until it breaks the Asphaltum off in places, and in a remarkably short time after the first outbreak it will be observed that the rust has broken out all over the structure. We think that so-called "Asphaltum Paints" should be classified as "Black Japan," and should never be used on structural iron as a protective coating.

Bessemer Paint.—The composition of this material is not given, neither is the preparation of the paint protected by patent. Even if we were to give the composition of the powdered materials used as pigment, as well as a list of the liquids combined to form the vehicle, it would not be possible to form therefrom a correct opinion as to the properties possessed by BESSEMER PAINT after it has been applied. The fact is that the parts of BESSEMER PAINT composing the pigment and those composing the liquid amalgamate so thoroughly when spread out thin with a brush that the tough, leather-like skin formed by them will show properties which cannot be found in either pigment or liquid tested separately. We wish to state that our aim in manufacturing BESSEMER PAINT is that of furnishing a material which will effectually resist all the chemical and electrical influences to which a metal surface is generally exposed. We therefore do not require ingredients which are absolutely indifferent to chemical or electrical action, but we rather have aimed and have succeeded in obtaining ingredients which will effectually resist the severest exposure

they are liable to get in practical use. Such liquids as water (free or in combination), benzine, turpentine, and others of the same class, do not enter into the composition of the vehicle, nor do we use any Oxides of Iron, Lead, Zinc, or other metals in the composition of the pigment. Expensiveness or cheapness of component parts have not been considered, but only their fitness as demonstrated by experiments and supported by actual use on a large scale. In carefully driving off all hydrogen and parts easily affected by heat, we have also rendered BESSEMER PAINT heat-proof to a higher degree than any of the so-called "fire-proof paints" which have as yet come under our observation.

We can, therefore, recommend BESSEMER PAINT most emphatically for use on structural as well as bridge and truss work in general, and more especially on such parts where the metal is to be protected against dampness saturated with fumes from locomotives and from manufacturing establishments. We can also recommend it for use on smokestacks, iron poles, lamp-posts, tin roofs, corrugated iron, galvanized iron, boilers, iron fences, trolley-poles, etc.

EXTRACT FROM OUR PAMPHLET "ABOUT RUST."

It is the purpose of these pages to present to those interested in the question, an augmented and revised reprint of an article which, by request, was written by a member of our firm for "Architecture and Building." Anybody who is in the least familiar with the methods of painting iron work and with the paints furnished for such purposes will readily admit that what was once the chief aim of such a paint has been forced into the background. While most engineers and architects are very strict in their requirements as to the tensile strength and composition of the iron or steel going into the structures designed by them, they frequently do not give sufficient attention to the paints intended for its protection. . . .

We have never yet seen in commerce an **Iron Oxide** paint pigment which was perfectly oxidized and free from sulphuric acid, and we do not think that we shall ever do so, because on the one hand the downward trend of prices for paint will not permit it, and on the other the production of such a material on a large scale would scarcely be possible, even if the highest price necessitated thereby could be obtained. An additional and even greater danger lies in the liberal use of so-called paint oils, mostly compositions representing a mixture of water, benzine (or turpentine), mineral oil and rosin. Such oils are offered freely to the trade. We received, for instance, from a large concern in Georgia, a printed circular offering

Java Oil, raw, at	20c.	per gal.
" " boiled, "the leading paint oil," at	23c.	" "
Baltic Oil, at	16c.	" "

About this latter the circular reads: "Baltic Oil, a reliable and cheap paint oil, dries quickly and with a good gloss. Wears well, and works smoothly under the brush. **Specially adapted for painting iron and all sorts of**

cheap outside WORK. Can be used alone, or combined with Linseed Oil. Price, 16c. per gallon." They might have added that such a paint oil mixed into a Linseed Oil paint will make it work more freely under the brush, because it does away with its viscosity. Of course it also does away with a good many of its other qualities. The circular ends with the following sentence: "Endurance is the best test of merit. These oils have been steadily growing in favor throughout the country for the past five years." We have given this quotation in order to show what can be done in regard to the vehicle. For all cheap paint oils it is nearly always claimed that they are as good or better than Linseed Oil, and his conscience need therefore not trouble the man who adds them freely to his paint, and thus makes the latter cheaper and easier-working! . . .

BESSEMER PAINT is made in one grade only by a secret process, which is not patented because it cannot be detected by analysis. The name of "BESSEMER PAINT," furthermore, is copyrighted, and "Ordinary" Bessemer Paint is, therefore, nothing but a swindle perpetrated at the expense of all concerned, because it may be taken for granted that he who will stoop to adopt such methods will also try to make as much money as possible, to the detriment of the architect, the owner and the manufacturer of the genuine article.

RINALD BROS.

PHILADELPHIA, December 15, 1894.

P. S. Just when about to go to press, we receive a postal card from New York, offering

Alpine Raw **Linseed** Oil	. .	19c.	per gal.
" Boiled " "	. .	22c.	" "
" Blending " "	. .	23c.	" "

REASONS AND REMEDIES FOR RUST ON SKELETON STRUCTURES.

Reprinted from "Architecture and Building."

The use of iron and steel for building purposes has increased to an extraordinary degree within the last decade. The advantages of skeleton structures are so numerous that their shortcomings are apt to be underrated. Amongst the most serious of these is the reduction of the crushing and tensile strength of the structural iron by oxidation or other changes in its composition. That this constitutes a grave danger cannot be denied; yet anybody who has followed the scant literature on the subject must admit that this question has received much less attention than it deserves. A gentleman, well known among architects and engineers, who has given considerable thought to this matter, answered our inquiry as to his opinion as follows: "I think the question an important one, but find it difficult to get architects and others to commit themselves on the subject. From my own personal inquiries amongst architects and engineers, I think they are largely working in the dark on this question. We know, of course, that many pieces of iron found in old masonry seem scarcely to be injured at all by the action of time; but we also find in masonry comparatively modern that the iron has so deteriorated as to be of little use."

The correctness of this statement cannot be doubted, can it be explained? The convenient and time-worn claim that manufacturers do not furnish so good a material in our days as they did in those of our ancestors will not answer in this particular case. Our iron is certainly as good as theirs, and the paint with which it is coated in seven cases out of eight is the same which they were in the habit of using—Red Lead mixed with Linseed Oil. Some people may say that you cannot obtain nowadays the same high grade of Linseed Oil as formerly. This is

an error. With our modern methods and appliances, the manufacturer can and does furnish as good a Linseed Oil, maybe even a better one, than his predecessor. This is especially true of boiled oil. We are neither Corroders of Lead, nor are we Crushers of Linseed; but we do not hesitate to say that there are not only one or two, but many concerns in this country whose Red Lead or Oils are in every respect equal, and probably even superior, to those of fifty years ago. They are as nearly chemically pure as commercial articles can possibly be; yet iron painted therewith is often found to rust within a few years, while in other instances it has remained in perfect condition. To illustrate we will quote a passage from a letter of the Berlin Iron Bridge Co., East Berlin, Conn. (Vol. XX, No. 21, of "Architecture and Building,") which reads as follows: "This Company has taken out iron bridges which had been up twenty-five years, and found that those parts which were most exposed to the action of the elements were entirely free from rust and apparently in as good a condition as when the bridge was put up twenty-five years before. These parts were so covered that we know they could not have been painted during this time, and yet they were not so covered as to prevent the action of the elements upon the material. On the other hand, we have seen bridges that were PRACTICALLY RUINED in certain parts IN FIVE YEARS' time from action of the rust, AND APPARENTLY THERE WAS NO MORE CAUSE FOR THIS IN ONE CASE THAN IN THE OTHER, NO REASON WHY THE PARTS OF ONE BRIDGE SHOULD SHOW EXCESSIVE RUST, AND SIMILAR PARTS IN ANOTHER BRIDGE SHOULD BE ALMOST ENTIRELY FREE FROM RUST."

The passage just quoted is only one of its kind. We have often heard almost exactly the same statement made with reference to parts of bridges, and on investigation WE HAVE IN EVERY CASE BEEN ABLE TO FIND THAT **there was a reason**, and that it would have been surprising indeed if those parts had remained intact. The process of oxidation (rusting) is so well known and well defined in all its details, and its causes are known so perfectly, that a thorough investigation will never fail to reveal them. Incidentally such an investigation is also bound

to reveal to every unprejudiced observer that *Red Lead in Oil often does not prevent rusting*. The fact that "in good old times" it did so is very cleverly made use of by those interested in its manufacture, affording them material for arguments in favor of "the old reliable stand-by" against "new-fangled ideas." Sentimental effusions, however, do not prevent rusting, nor do they interfere with changed conditions. We are apt to forget that "in the good old times" paints were scarcely ever exposed to any of the influences which in our days tend to destroy them so speedily. Our grandfathers did not burn coal, nor did they manufacture gas. They did not build railroads, nor did they use electricity. The air in their cities was as pure, as the country air of our days. There was no considerable amount of carbonic acid gases to attack the paint. The rain water did not bring down sulphuric acid, which now destroys our roofs painted with either Iron Rust (Metallic Brown) or Lead Rust (Red Lead). There was little electrical action to pit the iron and to weaken it by changing its structure. If, therefore, to-day we want to protect metal, we must not forget that we have to contend with conditions requiring a departure from former methods.

In our pamphlet "Iron vs. Rust" we have alluded to the objections to Red Lead (Lead Rust) and Metallic Brown (Iron Rust) as paint pigments. We have also briefly shown some of the objections to Linseed Oil as a binding material (vehicle). We may add that Linseed Oil is not impermeable to moisture, and that it is easily attacked by alkalies even in weak solutions, forming a soap therewith.

As to Graphite, which has been used lately to a large extent, we have briefly pointed out its most evident shortcomings as a paint material in a communication to "Architecture and Building," a copy of which will be found herewith, under the heading of "Graphite Paint" (Page 25).

In our aforementioned pamplet "Iron vs. Rust" the qualities which we consider essential in a paint for iron work and which are embodied in **Bessemer Paint** are named under the caption of "Desiderata." Page 7.

THERE SEEMS TO BE A GENERAL OPINION THAT IRON OR STEEL USED FOR SKELETON WORK IS NOT LIKELY TO DETERIORATE SO EASILY AS THE SAME MATERIAL WHEN USED IN BRIDGE WORK. This at first glance appears to be self-evident, the iron frame work in a building being covered up, and the air or gases not having free access thereto. However, a careful consideration of the circumstances will lead to the conclusion that **structural iron exposed to the weather is likely to last longer than the same surrounded by masonry,** because :

First.—Exposed iron work is, in nearly all cases, under constant supervision of an inspector.

Second.—Any rusting thereof to a considerable degree is soon noticed by any employé.

Third.—The air and sun having free access to the structure, acid fumes, moisture and gases are dissipated before they have been able to do much damage, while water coming in contact with the paint will evaporate or will be blown off before it can soak through the paint.

Fourth.—A weakening in any point of an iron bridge, even when not noticed at once, will manifest itself very soon by deflection or otherwise, and can be repaired before much damage has been done.

Now let us look at a skeleton structure, all covered up. Its chances of durability seem less favorable, for the following reasons :

First.—Most buildings, after leaving the hands of the architect, are no longer under constant control of an inspector.

Second.—Even where the supervision is continued after the building has been finished, it is not possible to ascertain whether any rusting is going on, because the iron frame-work is covered up.

Third.—If, therefore, the skeleton is attacked by chemical influences, say by gases leaking through from defective flues, waste pipes, etc., or by the presence of water, this is not likely to be detected. Where the leak is of large proportion, eventual detection is assured ; but where the leak is a small one, the damage done will not be noticeable, but it will nevertheless with time assume serious proportions, because one and the same spot will be attacked continu-

ously by the drippings from defective water-pipes or by the gases escaping to it from flue or from waste pipes, etc. The spot thus attacked is bound to rust away on account of constant exposure, there being little opportunity for the water to evaporate or for the gases to be carried away.

Fourth.—Parts weakened in this way will not be noticed, because even where the carrying strength of the skeleton is reduced considerably, the nice distribution of the weight upon the partitions will not permit of any deflection unless interfered with by some lateral strain, when trouble of a serious nature will result.

The parallel just drawn will, we believe, prove to all unbiased minds that the necessity of careful protection against oxidation is of greater importance in skeleton work than it is in bridge work. Moreover, iron skeletons in buildings have to contend with exposure of a more serious nature than any to which bridges are subjected. Strange to say, little, if any, allusion has thus far been made to the dangers resulting from electrolysis. All modern office buildings are covered with a perfect network of copper wires, some of them carrying strong currents of electricity. The general impression is that these wires are thoroughly insulated ; but any electrical engineer will admit that this impression is not altogether correct. The insulations used at present are far from perfect, and this is especially true of those which are not exposed to view, and which, therefore are even less likely to be repaired when they become defective than the exposed ones. The proof of this assertion is given by the fact that four-fifths of the fires occurring in modern store buildings are attributed to defective insulation. The impossibility of effectually isolating electrical currents by the processes now in commercial use is sufficiently shown in the complaints about electrolysis ruining the gas pipes and water pipes in cities where trolley systems are used to any extent. The trolley companies take all possible precautions to protect themselves against loss of electric power from the feed wires and return wires, and protect them in a much more careful manner than the Electric Light Companies consider sufficient. Nevertheless, the current "leaks out" to such a degree that many iron pipes carry enough to permit of its

being put to practical use. In this respect we want to point to an incident lately reported in the newspapers. A large drug store in Brooklyn had electric lights and fans going, notwithstanding the fact that the proprietor had discontinued his contract with the Electric Light Company. An investigation instituted by that company brought to light that the ingenious apothecary had "tapped" the water pipe in his cellar, which was loaded with electricity, using the gas pipe to return the current. While we should not like to be held responsible for the truth of this newspaper report, we do not doubt that the scheme would have been quite feasible.

Having shown that there is a great amount of electricity carried into large store and office buildings, it will scarcely be necessary to say that wherever this electricity breaks out, so to speak, it is bound to find its way towards the metal. The question is, whether metallic paints, especially Red Lead, offer a protection against electrical influences. We claim that they not only do not protect, but that, on the contrary, wherever there is any electricity around, OXIDE PAINTS WILL ACCELERATE THE PITTING AND DECOMPOSITION OF THE METAL. This is so self-evident that scarcely any corroborative facts need be adduced; for is it not known that coatings of metallic paint ground in oil and applied to iron or steel produce a galvanic action which can be measured? In a very able and interesting paper read before the Manchester (Eng.) Society of Engineers about a year ago, Mr. William Thomson has this to say: "When iron combines with oxygen, as much energy in the form of electricity and heat is liberated as was required to be expended in tearing the two apart in the process of smelting. For rusting to take place it is necessary to have another substance, which is electro-negative to the iron, to be in contact with it, so that the current of electricity liberated by the oxidation of the iron passes away to the metal or other material which acts as the electro-negative element. In this way the iron acts as one of the elements of a Voltaic cell.

. . . "If you examine a piece of iron which has become corroded by oxidation, you will observe that the corrosion has taken place in small holes or pits, and this

is technically known as "Pitting." These are produced by some impurity existing in the iron, which ultimately forms, under favorable conditions, the centre of the pit. This may be a piece of carbon, a minute portion or speck of manganese or other substance which is electro-negative to the iron, which latter being electro-positive, becomes oxidized. IT IS CURIOUS THAT WHEN RUST BEGINS TO FORM ON IRON IT USUALLY ATTACKS IT AT CERTAIN MINUTE POINTS, AND EXTENDS LIKE SPOTS OF MOULD, **the Oxide of Iron itself acting as an electro-negative element to the iron** upon which it rests, so that when a piece of iron has become rusty it is very difficult after cleaning to prevent it from again becoming rusty, unless every particle of rust can be most carefully removed from it, each particle forming an electro-negative element, around and under which the electro-positive iron begins to oxidize and produce a small hole or pit." It seems to us that this exposition of the galvanic action produced on the iron by other metals is a very clear and forcible one, and one which has been proved by actual experience in many cases. Now if iron and steel are so prone to become decomposed by the electricity generated by them on such slight provocation, is it not perfectly clear that in the case which we are now considering electrolysis should speedily decompose them?

The fact alone that BESSEMER PAINT is more indifferent to electricity than any other paint certainly makes it the only one fit for the protection of skeleton structures against the ravages of electricity

In conclusion we want to call special attention to two serious mistakes which have been made repeatedly by architects and engineers specifying **Bessemer Paint.** The first one is that of incorrect specification mostly based on the mistaken idea that "more is better than enough." In order to be thoroughly and permanently protected metal requires only two thin coats (not counting the touching up before second coat) of **Bessemer Paint.** A third coat is not only unnecessary, but it is even less advantageous than two coat work.

It would be utterly wrong to prescribe a priming

coat of Red Lead or Iron Oxide. While it is true that two coats of **Bessemer Paint** will protect such a priming against outside influences, it is also true that the metal itself forms a better base for **Bessemer Paint** than either of the above materials, and where it can be done, it is therefore **not only cheaper, but also better,** to apply **Bessemer Paint** direct to the metal.

The second mistake is of a more serious nature and of more frequent occurrence, and consists of the omission to notify us of specifications for **Bessemer Paint.** We have repeatedly met with gentlemen who were under the impression that certain work under their supervision had been painted with **Bessemer Paint,** because they had specified it. The contractor, however, had preferred to supply an imitation, which possessed none of the qualities of **Bessemer Paint** and therefore did not prove durable. The contractor had in most cases been paid for his work, and in others it was impracticable to have him do the work over again. This shows the importance of notifying us of specifications, so that we can see that **Bessemer Paint,** of which we are the exclusive proprietors and manufacturers, is actually used where it has been specified. It would furthermore be advisable to inform us of the amount of square feet to be covered, so that we can see to it that the work is done honestly. We have had cases in which the advantages obtained by the use of **Bessemer Paint** have been greatly interfered with by the admixture of some other material either as vehicle or pigment. **We have a reputation at stake in seeing that work done with Bessemer Paint is done in first-class style, so that we may be justified in referring thereto.** We therefore would suggest to have all specifications for Bessemer Paint drawn in a manner similar to the one suggested by us.

"GRAPHITE PAINT."

(Extract from a letter to "Architecture and Building.")

As to the use of flake graphite instead of red lead or iron oxide (which latter is the most expensive paint, because it nearly always acts as a rust-producer rather than a rust-preventer,) we certainly believe it preferable to red lead as it is little affected by chemical influences. We, however, found it to possess the disadvantage of not covering a surface thoroughly. There would be small spots remaining uncovered and in those spots rust would set in. The samples of graphite paint on tin prepared by us for tests showed that the flake graphite had not been dissolved by the oil but that the latter simply acted as a binder, which we notice is claimed by the manufacturer as an advantage in the following sentence: "An ideal pigment is one that will not absorb the oil or affect it chemically, or be affected by it." This statement is somewhat erroneous. An ideal pigment ought to be one that is dissolved by oil into minute particles which remain suspended therein. Surely nobody will deny that such a pigment will make a better paint than a pigment which does not "absorb the oil," or, expressed more clearly, which will not readily dissolve into small particles. Wherever the flakes do not "lap" one over the other there will be found small spots covered by nothing but oil. Anybody, by the aid of a microscope, may find out for himself that the claim as to the "overlapping of the flakes" is a purely theoretical one. In reality these flakes will be found to "stand up" at all sorts of angles to the metal and to each other.

APPENDIX.

LABORATORY TESTS.

PROF. DR. R. FRESENIUS,

WIESBADEN, GERMANY, JUNE 26, 1889.

(Extract from Report.)

The tests covered iron, tin and zinc. Plates made of these metals were painted with two coats as per instructions. The coating proved to be extremely elastic when fresh, as well as after having been applied for several months. It was found that pieces of tin painted with BESSEMER PAINT could be bent continuously in all directions without peeling or cracking of the paint. It therefore appears that the paint is well adapted for use on metal being temporarily or continuously in motion, for instance bridges and parts of machinery. *Continued and intense exposure to the direct rays of the sun, as well as to heat (212° F.) does not affect BESSEMER PAINT in the least.* Applied gases and fumes had no effect whatever either on the paint or on the metals covered with it. Acid solutions do not affect the paint even when concentrated to 20° B.

An opinion regarding BESSEMER PAINT may be expressed to the effect that it is in every respect well adapted for painting metal construction exposed to the average atmospherical influences, especially where there is also exposure to continuous movements and to jarring.

SCIENTIFIC TESTING STATION FOR BREWERIES, MUNICH, BAVARIA.

Extract from a Letter written by *Director Aubrey* to a Customer.

"I am in a position to recommend BESSEMER PAINT most highly, because, when used according to instructions, it protects iron decidedly far better than any of the articles for that purpose which are known to me, or which I have ever tested. The painting which has been done with BESSEMER PAINT in our laboratory has been exposed to the most varied influences, and up to this day has remained intact. A great advantage of this paint is indeed its extraordinary elasticity. Without drying too slowly or remaining sticky it still remains soft enough to prevent the possibility of cracking, and it therefore protects iron perfectly."

BESSEMER PAINT vs. RED LEAD.

Grand Ducal Chemical Testing Laboratory.

Grossherzogl. Chemische Pruefungs und Auskunfts Station fuer die Gewerbe.)

DARMSTADT, GERMANY, SEPT. 23RD, 1892.

(Extract from Report.)

About *sixty comparative tests* were made with BESSEMER PAINT and Red Lead, both being applied in exactly the same manner by an expert painter. The painter found BESSEMER PAINT to work easier and more quickly than Red Lead. On the pieces painted with one coat the Red Lead did not cover thoroughly, while with BESSEMER PAINT a perfectly uniform and dense covering of the surface was obtained. BESSEMER PAINT is superior to Red Lead in opaqueness as well as in covering capacity. The difference of surface covered by equal quantities of BESSEMER PAINT and Red Lead has been ascertained by means of about sixty different tests. It has been found possible to ascertain exactly the quantity of paint used on a unit of surface. This has been done by means of carefully measuring the pieces of sheet iron and by weighing them before and

after painting. The average of the results thus obtained figures as follows :

(36.1 gram.) 1.26 oz. per sq. meter (39.37 in.) were required for 30 single coats of BESSEMER PAINT.

(99.7 gram.) 3.5 oz. per sq. meter were required for 15 single coats of Red Lead.

(73.2 gram.) 2.58 oz. per sq. meter were required for 10 double coats of BESSEMER PAINT.

(221.1 gram.) 7.79 oz. per sq. meter were required for 9 double coats of Red Lead.

(Follow tables giving details about these tests.)

By means of a micrometergauge a single coat BESSEMER PAINT was found to be of a thickness equal to that of a single coat of Red Lead. The same was found true as regards double coats of both paints. *From the figures just given it has been computed that for covering a square meter of light sheet iron with a uniform coating it will take 2.8 times more Red Lead than BESSEMER PAINT. To cover the same surface with two coats of Red Lead it will take three times more Red Lead than BESSEMER PAINT.* As one kilogram (2.20 lbs.) of the latter can be obtained for one mark (24c.), while best Red Lead ready mixed costs from 50 to 52 pfennigs (about 12c.) the use of BESSEMER PAINT shows *a saving, in cost of material only, of from 40 to 50 per cent.* It has, however, been found, as will be seen from the test mentioned further on, that a double coating with BESSEMER PAINT makes a fine and glossy finish, and that it offers a perfect and durable protection against rust, while one or two coats of Red Lead usually form only the base for one or more coats of Oil Paint. These latter coats become superfluous where BESSEMER PAINT is used, and the saving is increased to a considerable extent, on account of the reduced outlay for paint and wages.

As to the elasticity of BESSEMER PAINT, we can report favorably. (Follow details about very severe tests.) Even when heated to a high temperature the coating of BESSEMER PAINT did not lose its elasticity. Its resistance to different influences has been investigated most carefully : *damp air containing carbonic acid gas did*

not affect it. The coating did not show any change after being exposed for two days to a heat of 316° F. The resistance to mechanical action (pressure, concussion or hammering) has been found excellent. A double coating of BESSEMER PAINT is sufficient to afford iron construction a lasting protection against atmospherical influences.

As to chemical influences, BESSEMER PAINT affords protection in many cases. We were able to ascertain that BESSEMER PAINT remained in perfect condition when exposed for about two days to waste gases from boiler firing, to hydrogen sulphide gas, diluted chlorine, bromine and iodine, and even when exposed to a large amount of muriatic acid gas. BESSEMER PAINT resists the action of exhaust steam much better than Red Lead.

Finally it may be mentioned that diluted acids, as for instance, acetic, nitric, sulphuric and muriatic acid, do not affect BESSEMER PAINT. (Follow details about sheet iron plates painted with BESSEMER PAINT and then rolled around a cylinder and exposed to a high temperature, which test did not affect the BESSEMER PAINT, while the Red Lead was found to peel off as soon as an attempt was made to straighten the iron.) Exposed to great volumes of muriatic acid gas for thirty hours BESSEMER PAINT remained in good condition, while Red Lead was utterly destroyed. Dilute hydrogen sulphide gas does not change BESSEMER PAINT, while it blackens Red Lead. Two days' exposure to super-heated steam of 1½ atmospheres pressure proved BESSEMER PAINT to be of greater resistance than Red Lead. We can therefore give it as our conclusion with regard to BESSEMER PAINT that a double coating of this article offers excellent protection to iron construction exposed to atmospherical influences as well as to gases produced in industrial establishments.

[Signed] PROF. DR. C. THIEL.

[*We should like to add to this statement referring to the comparative cost of BESSEMER PAINT and Red Lead*

that in this country BESSEMER PAINT is furnished at 12c. per lb. ($1.50 per gal. in 50 gal. barrels,) while Red Lead mixed in pure Linseed Oil costs 7½c. per lb. It will therefore be seen that where three times 7½c., that is to say 22½c., worth of Red Lead is required, it will take only 12c. worth of BESSEMER PAINT to do the same work.

Rinald Bros.]

ROYAL MECHANICAL ANALYTICAL INSTITUTE, BERLIN—CHARLOTTENBURG.

(Koenigl. Mech.—Tech.—Versuchsanstalt, Berlin—Charlottenburg.)

(Extract from an Official Report.)

A detailed statement is given as to the precautions taken in obtaining samples of several different paints which were to be used for comparative tests, and then it is stated that all these samples were applied by a professional painter under the Institute's supervision. The manner in which the paints were applied is mentioned, as well as the amount of material used to cover a certain surface, the time required for drying, etc. Then the report continues: "It was found that BESSEMER PAINT would become dry in an average time of nineteen hours. This, however, refers to work which was done in the open air at a most unfavorable season, that is to say, in December, when the general humidity ranged between 80 and 90 per cent. To enable a comparison with other paints for iron it is stated that *Iron Oxide had not become any dryer within twenty-six hours than BESSEMER PAINT was found after ten hours.* The coating of paint on the pieces of tin painted with BESSEMER PAINT was found to remain perfectly elastic although it had dried hard, and BESSEMER PAINT therefore offers very great resistance against exterior influences.

THICKNESS OF COATING.

The means of ascertaining this are given in detail, and the results obtained are set forth in a table showing that on an average *152 per cent. more of Red Lead than of*

BESSEMER PAINT was required to do the same work. A short extract from this table will give some details about percentages:

BESSEMER PAINT, 1st coat on smooth tin, 33 parts	100 per cent.
Red Lead, 1st coat on smooth tin, 93.6 parts . .	284 per cent.
BESSEMER PAINT, 1st coat on rough tin, 32.9 parts	100 per cent.
Red Lead, 1st coat on rough tin, 87.3 parts . .	265 per cent.
BESSEMER PAINT, 2nd coat on smooth tin, 38.3 parts	100 per cent.
Red Lead, 2nd coat on smooth tin, 79.1 parts .	206 per cent.

BESSEMER PAINT, as a means of protection against rust, offers the advantage over red paints of making it possible to discern any rust spots under it. Heated in a metal bath up to 392° F., no change was noticeable in aspect or otherwise. *It adhered even more strongly after having been heated than before. The Red Lead coatings, on the other hand, become soft as soon as heated, and drew blisters.* After cooling, the Red Lead could be removed easily in powder form. The resistance when bending and twisting the plates painted with BESSEMER PAINT was looked into carefully, and was found to be much greater than necessary for practical use. (Follow table giving details about tests made with metal plates covered with scale, and with other plates which had been cleaned.) On partly painted plates exposed to air containing carbonic acid gases, the unpainted parts would show large spots of rust, while those covered with BESSEMER PAINT were entirely free from rust. Combustion gases, while producing rust on the unpainted iron, did not interfere with the firm adherence of the paint on the painted parts. The plates which had been bent and exposed to combustion gases were free from rust where painted with BESSEMER PAINT, *while those painted with Red Lead showed a slight coating of rust, which had formed under the paint, and was strongest on the bends.*

A number of other exposures to chemical gases mentioned in detail gave excellent results as far as BESSEMER PAINT was concerned.

PHILADELPHIA TESTING LABORATORY.

Analysis of Ores, Metals, Fuels, Gases, Water, etc., Philadelphia, September 21st, 1894.

"I have used your BESSEMER PAINT in my chemical laboratory for over a year, and find that it has entirely prevented the rusting of everything painted with it. Iron apparatus quickly rusts, even when coated with asphalt or japan, but your paint seems to be entirely indifferent to chemical fumes. One point about it particularly gratifies me, viz.: its behavior on stove-pipes and apparatus frequently heated too hot to hold in the hand is just as satisfactory as on the apparatus which is not heated." Very respectfully,

[Signed] EDWARD K. LANDIS.

RAILROAD LABORATORY TEST, No. 2769.

A large railroad company, not a customer of ours, but whose chemist is an authority on paints, has kindly furnished us copy of the following report, against our promise not to make use of their name:

"*BESSEMER PAINT, ready mixed, from Rinald Bros., Philadelphia:*

"The composition of this paint is unusual, and I have not yet been able to make a satisfactory analysis. Specific gravity, 2.23; ground medium, coarse; under short brush works fairly well; has fair body (*sic!*). The adhesion is fair, and the *flexibility very superior. Entirely unaffected by moist sulphurous and hydro-sulphuric acid at a temperature of 110°* F. **Evaporation test, 14 times refilled.** One coat, slightly rusted; **two coats, No Rust.**"

PRACTICAL RESULTS.

U. S. ENGINEER'S OFFICE.

POST OFFICE BUILDING,
WILMINGTON, N. C., October 26, 1899.

MESSRS. RINALD BROS., PHILADELPHIA:

Gentlemen:—Replying to your inquiry of 19th inst., concerning BESSEMER PAINT, I have to inform you that it has been used to a considerable extent on iron and steel work at Fort Caswell, North Carolina, with very satisfactory results, both for *protection in damp air* and for *resisting heat* when used on smoke-stacks, steam pipes, etc. Very respectfully,

E. W. VAN C. LUCAS,
Captain Corps of Engineers, U. S. A.

HERMANN LAUB, CIVIL ENGINEER.

LEWIS' BLOCK,
COR. SIXTH AVENUE AND SMITHFIELD STS.,
PITTSBURG, PA., February 26, 1903.

RINALD BROS., PHILADELPHIA:

Gentlemen:—I am pleased to certify that your BESSEMER PAINT has been specified by me, and was used for *Galvanizing Plants* and *Glass Factories* during the last *ten years*; and I am further willing to state that amongst the better paints I consider the *BESSEMER PAINT the most durable*, if put on properly.

Respectfully yours,

HERRMANN LAUB.

OFFICE OF JAIL WARDEN.

CHARLES W. DODD, Warden,
UNION CO., N. J.,

ELIZABETH, N. J., February 20, 1902.

RINALD BROS., PHILADELPHIA, PA.:

Gentlemen:—We used your BESSEMER PAINT on the county building in the *summer of 1895*, and up to the present time it has given perfect satisfaction.

Yours truly,

CHARLES W. DODD.

NATIONAL WALL PAPER CO.

CRESWELL & WASHBURN, Branch,
18th AND WASHINGTON AVE.,

PHILADELPHIA, February 26, 1902.

Letter written by us to Messrs. Creswell & Washburn.

Dear Sirs:—"*Over eight years ago*, in Fall 1893, we had the pleasure of supplying you with the Bessemer Paint for painting the roof of your mill. You may remember that at the time you thought the paint rather expensive, and it would therefore interest us very much to know whether you are of the same opinion now or whether you have found that Bessemer Paint is the cheapest thing to use in the long run on account of its greater durability. We should like very much to know in what condition the paint is at the present time, as we have all reasons to suppose that it is still giving you perfect satisfaction."

Messrs. Creswell & Washburn replied with a footnote on our letter as follows:

February 27, 1902.

"Entirely satisfactory."

C. & W., Ltd.

A. & H. HILLARY, REAL ESTATE.

1517 N. 17TH STREET,

PHILADELPHIA, March 1, 1902.

MESSRS. RINALD BROS.:

Dear Sirs:—In reply to yours of the 26th ult., we would say that we have used Bessemer Paint on our *tin*

roofs, and after a lapse of three years we find them to be in first class condition, and the paint itself looks as well as when it was put on.

We take pleasure in saying Bessemer Paint has given us entire satisfaction.

Yours truly,

A. & H. HILLARY.

YOUNGSTOWN IRON & STEEL ROOFING CO.

YOUNGSTOWN, OHIO, March 6, 1902.

RINALD BROS., PHILADELPHIA, PA.:

Gentlemen :—Your favor of the 3d received. Note your request in reference to our using your Bessemer Paint *in 1896*. That is too far back. Do not remember that we have heard from it since or thought about it. It must have given satisfaction or we would have heard complaint.

Yours very truly,

THE YOUNGSTOWN IRON & STEEL ROOFING CO.

JOHN O. PEW, *Gen'l Mgr.*

THOMAS D. TROTT, BRICKLAYER & BUILDER.

257 W. RITTENHOUSE ST.,

GERMANTOWN, PHILA., March 7, 1902.

RINALD BROS., PHILADELPHIA, PA.:

Gentlemen :—I have used your Bessemer Paint for painting *tin roofs*. I painted some roofs about *five years ago* with your Bessemer Paint. The paint is good on the roofs still. No rust. I think it is the best I have ever used.

Yours truly,

THOMAS D. TROTT,
257 West Rittenhouse St.,
Germantown, Phila., Pa.

COMMERCIAL MILLING CO.

Established 1855.

DETROIT, MICH., February 21, 1902.

MESSRS. RINALD BROS., PHILADELPHIA, PA.:

Gentlemen:—We have yours of the 18th inst., and in answer beg to state that we used your Bessemer Paint to cover an iron clad elevator and that the same has given good satisfaction for this purpose.

Respectfully yours,

COMMERCIAL MILLING CO.

GOWER & SPEIGHTS.

GREENVILLE, S. C., March 10, 1902.

RINALD BROS., PHILADELPHIA, PA.:

Gentlemen:—This Bessemer Paint was used on the iron works of the *Electric Power Plant and Car Sheds.* We have had no complaint, consequently we believe same has proven satisfactory.

Yours truly,

GOWER & SPEIGHTS.

THE CONSUMERS BREWING CO.

Brewery Department.

General Office, BULLITT BUILDING,

PHILADELPHIA, March 12, 1902.

MESSRS. RINALD BROS.,

1142 N. Hancock St., Philadelphia, Pa.:

Dear Sirs:—Answering your letter of the 28th ult., in reference to Bessemer Paint applied to *tanks and boilers in our Welde and Thomas Department in 1897*, I find that the same was put in use at the time you state and seems to be giving good satisfaction.

Yours truly,

H. A. FOSTER,

Receiver.

ORDNANCE OFFICE, WAR DEPARTMENT.

WASHINGTON, D. C., October 22, 1891.

"I have the honor to inform you that your Bessemer Paint has been used for painting the guns at Sandy Hook, and that the following is an extract of a report received from the Commanding Officer of that post on the subject. 'It is found by the tests up to date, that Bessemer Paint stands better the wear and tear of transportation, firing, etc., than others It gives a pleasing appearance to the gun—has a good body, does not blister or scale off by the heat of the weather or firing, and it seems to be well fitted for adoption for heavy guns in service.'

In view of this report, will you please inform me at about what rate this paint could be delivered at New York Arsenal?"

Respectfully,
CHARLES SHALER,
Capt. Ord. Dept., U.S.A.,
Acting Chief of Ordnance.

SECOND LETTER.

SANDY HOOK PROVING GROUNDS.

NEW YORK, December 21, 1894.

"In reply to your letter of the 15th inst., I have to inform you that the Bessemer Paint in use at this post has given satisfaction."

Very respectfully, your obedient servant,
FRANK HEATH,
Capt. Ord. Dept., U.S.A.,
Commanding.

THIRD LETTER.

Subject: Paints. W. A. 117.

WATERVLIET ARSENAL.

WATERVLIET, N. Y., July 23, 1903.

RINALD BROS., PHILADELPHIA, PA.:

Gentlemen:—At two of the stations where I have been on duty formerly I have had occasion to use, *with very successful results*, your Bessemer Paint, and I now write to ask whether in your opinion it would prove successful on a galvanized iron roof. We have such roofs at this Arsenal and have had great trouble in finding a paint which will stick to it, the usual roof paints, after a short time, flaking off in large and small scales.

Respectfully,

D. M. TAYLOR,
Major Ord. Dept., U.S.A.,
Commanding.

NOTE.—We have answered the above letter to the effect that Bessemer Paint is the only paint that has successfully protected galvanized iron for many years. We have also stated that in order to make assurance doubly sure we advise to coat new galvanized iron with "**Rinald Bros. Galvanic Primer**" which makes pealing of paint impossible.

PENNA. LINES (West of Pittsburg)

LEHIGH VALLEY R. R.

GENERAL CHEMICAL CO.

ON

Bessemer Paint

(Registered Trademark)

EXHIBIT A. History of an old rusty bridge on Pennsylvania Lines painted with BESSEMER PAINT in 1892.

EXHIBIT B. Correspondence leading to painting the Towanda Bridge on Lehigh Valley R. R. with BESSEMER PAINT and results obtained.

EXHIBIT C. Results obtained with BESSEMER PAINT applied in 1892 to Stacks, Structural Iron, Corrugated Iron Sidings and Metal Roofs belonging to General Chemical Co.

EXHIBIT "A."

About twelve years ago the Pennsylvania Railroad Company's Western lines became interested in BESSEMER PAINT. They have since been regular users of BESSEMER PAINT, having found by actual experience that it offers better protection than other paints. When starting his tests Mr. Thomas Rodd, Chief Engineer of Pennsylvania Lines West of Pittsburg, selected Bridge No. 42, at New Galilee, because he wanted to determine whether and *for how long a time BESSEMER PAINT would interrupt the rusting of this bridge, going on at the time.*

First Report, made in April, 1893:

Subject: "BESSEMER PAINT FURNISHED BY RINALD BROS., PHILADELPHIA."

"Applied about July 6, 1892; appears to stand up well, and retains its gloss and color."

Second Report, February 9, 1894:

"I find the Bessemer Paint on Bridge 42 in fair condition, and I would say it will go two years before it will need paint. This is about *one year better* than the general run of paints we have been using."—*From Supervisors' Reports to Eng. M. of W.*

Third Report, November 9, 1894:

"BESSEMER PAINT on Bridge No. 42 in fair condition; no rust perceptible."

Fourth Report, February 25, 1903:

"Bridge No. 42 was painted with *Rinald Bros.' Bessemer Paint in 1892.* This paint remained in fair condition until 1897, at which time the corrosion began to show through the paint, although the paint did not scale. *In 1899* it was necessary to paint this bridge."

"Bridge No. 42 is a deck plate girder, and there is a great deal of shifting work done over the bridge; consequently the test on the paint is rather severe."

Moral: We "point with pride" to the fact that in above instance BESSEMER PAINT lasted exactly twice as long as the Supervisor of Bridges and Buildings expected a first-class paint to last. BESSEMER PAINT, therefore, saved the Pennsylvania lines one cleaning, scraping, and repainting of Bridge No. 42, aside from prolonging the life of the structure.

EXHIBIT "B."

From a somewhat voluminous correspondence about Paints and Oils, which we hope Mr. Berg, Chief Eng. L. V. R. R., enjoyed as much as we did, two letters have been selected, which are reproduced below. We have added to them the latest report (obtained by courtesy of Mr. E. B. Ashby, Eng. M. of W., L. V. R. R.), because it proves that our claims and theories, unlike the general run of theories, have stood the tests of time and practice in a most satisfactory manner:

PHILADELPHIA, June 11, 1895.

WALTER G. BERG, ESQ. :

Dear Sir :—We have read with great interest your paper on "Painting Iron Railway Bridges," published in No. 23 of "Engineering News," and must say that we share the opinion expressed about your article in the editorial columns of the same number. We furthermore were agreeably impressed by your absolute impartiality.

One passage in your article pleased us especially by the train of reminiscences it awakened in the writer. It was the following : "But in actual practice this ideal material and method of application can hardly be relied on in the long run, owing to the great temptation offered, and the prevailing tendency of the purchasing and administrative departments of a railway to judge the quality of materials and workmanship by the question of cost." If you had added one more word, and made it "the question of *imaginary* cost," the sentence would have pleased us still better. This reminds us that there are some passages in your paper which we should like to discuss if you will kindly give us a hearing.

Table of Materials.—You are certainly right in saying that it ought not to be "considered as presenting very reliable data." We can only say that if you place BESSEMER PAINT alongside of the National Lead Company's Red Lead, for instance ; have both put on according to instructions ; and then figure out your cost per one hundred square feet : you will find BESSEMER PAINT the cheaper of the two. (See table on page 31).

Analysis of BESSEMER PAINT.—"From information obtained from other sources, it would seem that the BESSEMER is a Linseed Oil paint, containing a little gum, the pigment being ground slag from the basic Bessemer furnaces." We do not see how a paint made by this process could possess the qualities which, to use your words, in "the general opinion of users," make it "a very superior article." We do not believe that the chemist exists who can determine a vehicle in a paint like ours, as the same is composed of organic matter compounded with the intention of making a chemical analysis as difficult as possible.

Conclusion of your article, is with one exeption, the only part with which we cannot agree at all (the one exception condemns "Black Bridge Japan"). You say: "The conclusion reached, therefore, is that Red Lead toned down with Lampblack is the best primer for iron." Now it cannot be denied that sulphurous fumes speedily destroy Red Lead, and that they also destroy Linseed Oil, and this is the reason why in train sheds and wherever else locomotive gases accumulate Red Lead is the worst paint that can be found. In the open country, and especially where the red lead primer is covered by two or three coats of good finishing paint, we have no doubt that it will prove very durable; but it will also be more expensive at first cost than BESSEMER PAINT, because of the latter only one coat is required for priming and one coat for finishing, while of the former you require one or two coats for priming, and two or three more of some other paint for finishing.

We were very glad to see you appreciate the good qualities of BESSEMER PAINT, and can assure you that its use on a large scale will prove the correctness of our statements, not only regarding durability and protective qualities of the material, but also regarding its low first cost.

We shall, of course, be glad to explain or discuss more in detail any of the points made in this letter, and meanwhile remain,

Very respectfully yours,
(Signed) RINALD BROS.

JERSEY CITY, N. J., June 14, 1895.

MESSRS. RINALD BROS., Philadelphia, Pa.

Gentlemen:—Answering yours of June 11th, I am much obliged for the appreciation you show of my article on painting. I would call your attention to the fact that the article refers to the general run of open bridges along the line of a railroad, and not specifically to train sheds and enclosed structural iron work.

Relative to the application of BESSEMER PAINT, I stated what several users of the paint had intimated to me, namely, that it required a better class labor, *i. e.*, intel-

ligence, to put on BESSEMER with success, and that it was particularly a little difficult to apply in cold weather.

Relative analysis of BESSEMER PAINT, I stated what "seemed" to be the constituents of it from best source available.

Relative conclusion I reached, you quote "The conclusion reached, therefore, is that red lead toned down with lampblack is the best primer for iron." The quotation is not correct without the balance of the sentence, namely, "according to the prevailing practice of the day ; but it is very desirable to test other paints at once, etc., etc., *including Bessemer Paint among others.*"

Yours respectfully,

(Signed) WALTER G. BERG,
P. A. Engineer.

Mr. Berg thereupon decided to give BESSEMER PAINT a practical test on a large scale by applying it to the Towanda Bridge, for which purpose twenty-one barrels were used. The results were so very satisfactory that the Lehigh Valley Railroad Company has since used BESSEMER PAINT very extensively.

Final Report, March 20, 1903.

"Mr. Berg, our Chief Engineer, advises that you have taken up with him the matter of BESSEMER PAINT applied to our bridge over the Susquehanna River at Towanda, and in response to your request as to how it has been acting, I would advise that the paint was applied during *August and September, 1895*, two coats being applied after a thorough cleaning of the iron work. The present condition of the paint is as follows: The web members, posts and diagonals, bottom chords and sides of top chords are *still in very good condition*. The top of the top chord is slightly scaling, and will have to be repainted soon. The floor system is now badly rusted, but this is undoubtedly due to a great extent to the drippings of brine from refrigerator cars."

Moral: **After eight years, still practically perfect.**

EXHIBIT "C."

In the beginning of 1892 the Pittsburg Bridge Company bought from us a very large quantity of BESSEMER

PAINT, which we found was to be used on several iron buildings that they had contracted to erect for Messrs. James Irwin & Co. A few years ago this firm, along with other leading manufacturers of heavy chemicals, was absorbed by the General Chemical Company. We submit two reports, one kindly sent us at the time by Messrs. James Irwin & Co.; the other, of a recent date, due to the courtesy of the General Chemical Company of Pennsylvania.

First Report, dated February 7, 1896.

"In receipt of your inquiry whether BESSEMER PAINT, applied to several of our iron buildings, about four years ago, is still behaving in a satisfactory manner, we would answer that if such was not the case we should not have continued to send you orders for paint.

"The BESSEMER PAINT furnished by you in 1892 was applied to the structural and corrugated iron used in the erection of our new *Sulphuric Acid Works. The outside is exposed to atmospherical conditions aggravated by the neighborhood of manufacturing establishments and the Allegheny Valley Railroad.*

"*The inner surfaces are exposed to heat, sulphurous and sulphuric acid fumes.*

"BESSEMER PAINT has withstood these corroding influences to our satisfaction, and *better than other paints* which we have used.

"We also used it on *iron stack*, where we found that the high temperature did not cause it to blister or scale off; it only changed its gray color to black, which, however, protected the iron just as well."

Second Report, January 29, 1903.

"Referring to letter from Rinald Bros., Philadelphia, beg to say, some of the structural steel and corrugated steel sheets on the building described by them had to be repainted *in the course of eleven years since they were first painted.* But there is a good part of the structural and corrugated material on which the *original paint is still good.* We have used BESSEMER PAINT and several well-recommended paints on different parts of our works and *found* BESSEMER PAINT *to be by far the best protection for iron and steel.*"

SPECIFICATION

FOR

"BESSEMER PAINT"

[illegible]

All metal to be painted must be thoroughly clean, free from rust and dry. Apply one shop coat of Bessemer Paint, made by Rinald Bros., Philadelphia, using the paint strictly in accordance with manufacturer's instructions. Before erecting touch up all bare or scratched surfaces, and give an extra coat to all parts not accessible after erection. Apply second or field coat as soon after erection as possible, brushing the paint out thoroughly. Avoid heavy coats, and do not thin the paint which is furnished ready for use.

RINALD BROTHERS'

Porcelain Enamel Paint

Outside Enamel

Technical Paints

Galvanic Primer